Carbon Capture & Storage: False Solution, *Real Impacts*

- https://brandcentral.dnvgl.com/mars/embed?o=4D2E198D781A6E6F&c=10651&a=N

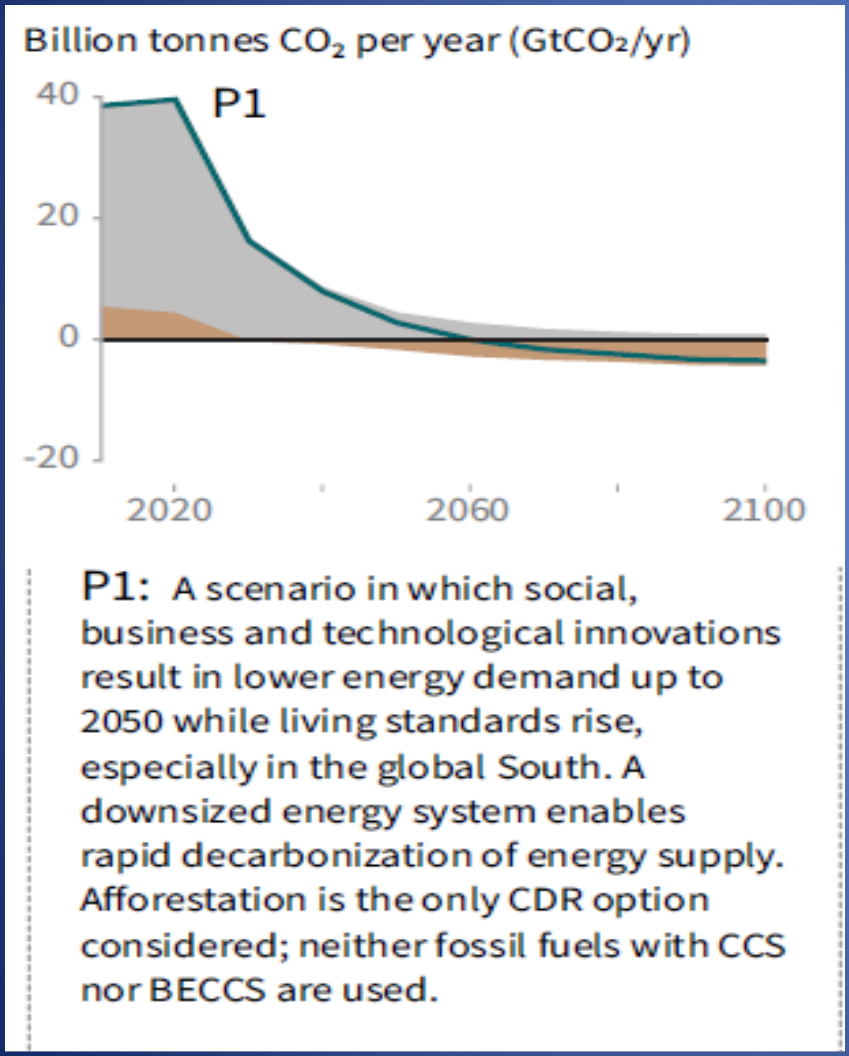
Carroll Muffett-Center for International Environmental Law
Presentation to Louisiana Climate Initiatives Task Force
Special Session on Industrial Decarbonization
October 19, 2021

CIEL
CENTER for INTERNATIONAL ENVIRONMENTAL LAW

Widespread and Rising Opposition to CCS/CCUS

- WH Environmental Justice Advisory Council
- Climate Action Network International >1500 Groups
- Gulf South for a Green New Deal > 200 Groups
- Indigenous Environmental Network/Climate Justice Alliance/Grassroots Global Justice Alliance
- >500 US and Canadian Groups in full page ads in leading national newspapers.
- Hundreds more in other sign letters and statements

IPCC SR 1.5 Pathway 1



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

- CO2 Reductions

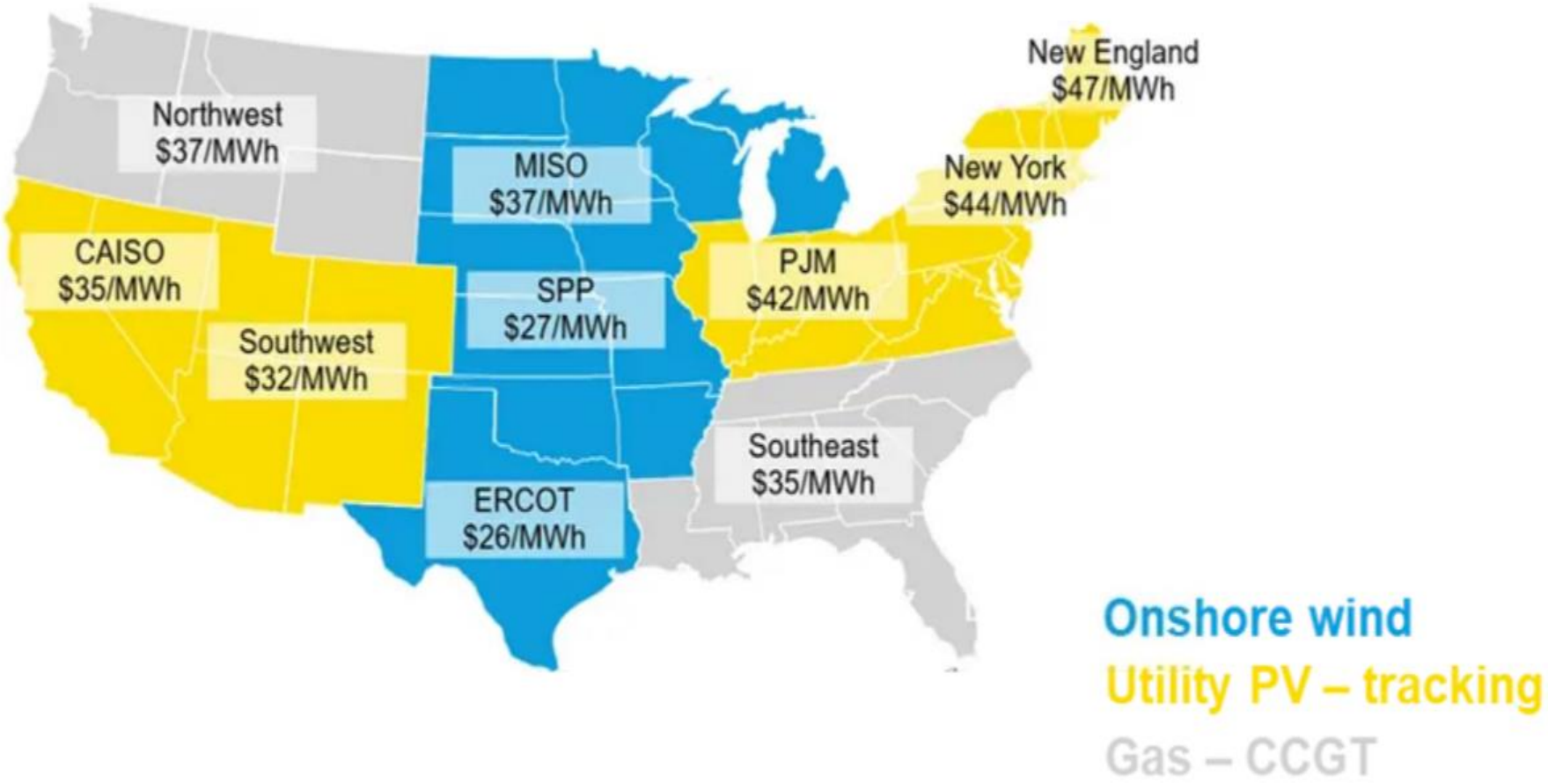
  -58% by 2030;

  -97% by 2050

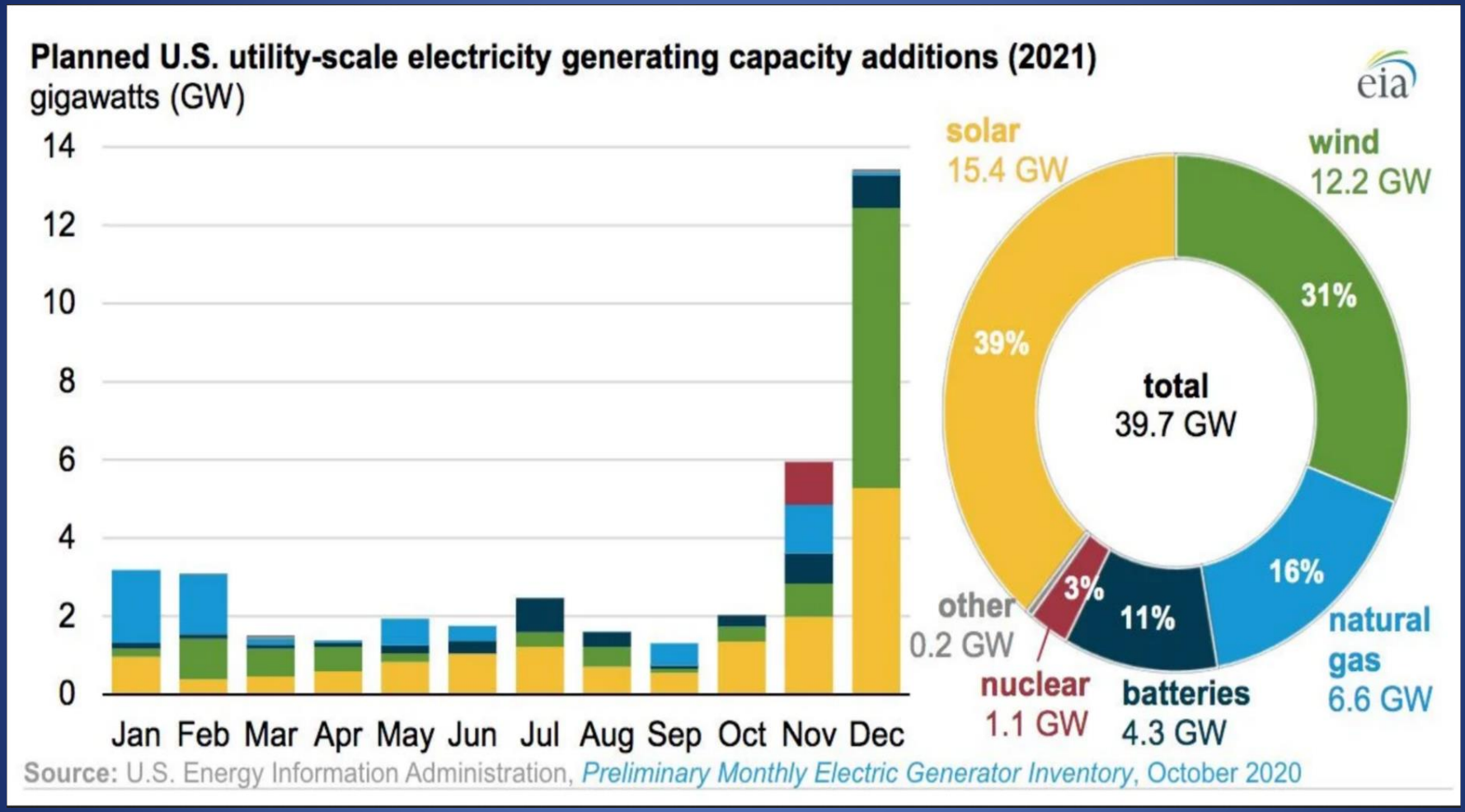
- Fossil Fuel Reductions
  - Coal (-97%)
  - Oil (-87%)
  - Gas (-74%)

Screen_Shot_2021-01-13_at_4.27.03_PM_1248_620_80.webp

Cheapest source of new bulk electricity

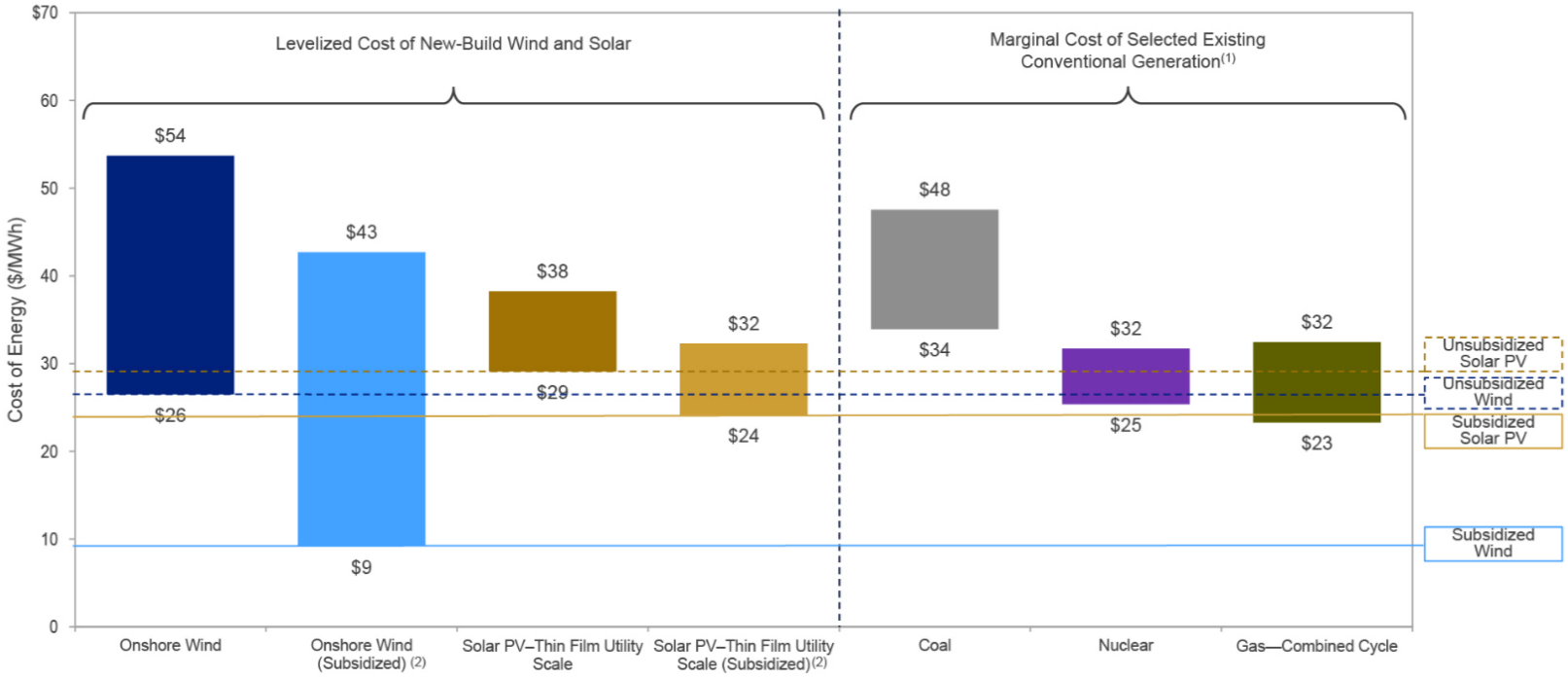


Note: Unsubsidized and leveled cost of electricity. Source: BloombergNEF


Planned U.S. utility-scale electricity generating capacity additions (2021)
gigawatts (GW)
eia
14
12
10
8
6
4
2
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
solar
15.4 GW
wind
12.2 GW
31%
39%
total
39.7 GW
16%
3%
11%
other
0.2 GW
natural
gas
6.6 GW
nuclear
1.1 GW
batteries
4.3 GW
Source: U.S. Energy Information Administration, Preliminary Monthly Electric Generator Inventory, October 2020

Levelized Cost of Energy Comparison—Renewable Energy versus Marginal Cost of Selected Existing Conventional Generation

Certain renewable energy generation technologies have an LCOE that is competitive with the marginal cost of existing conventional generation



Source: Lazard estimates.

Note: Unless otherwise noted, the assumptions used in this sensitivity correspond to those used in the global, unsubsidized analysis as presented on the page titled "Levelized Cost of Energy Comparison—Unsubsidized Analysis".

(1) Represents the marginal cost of operating fully depreciated gas combined cycle, coal and nuclear facilities, inclusive of decommissioning costs for nuclear facilities. Analysis assumes that the salvage value for a decommissioned gas combined cycle or coal asset is equivalent to its decommissioning and site restoration costs. Inputs are derived from a benchmark of operating gas combined cycle, coal and nuclear assets across the U.S. Capacity factors, fuel, variable and fixed operating expenses are based on upper and lower quartile estimates derived from Lazard's research.

(2) The subsidized analysis includes sensitivities related to the TCJA and U.S. federal tax subsidies. Please see page titled "Levelized Cost of Energy Comparison—Sensitivity to U.S. Federal Tax Subsidies" for additional details.

- https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2020/

Cost Analysis of Carbon Capture and Sequestration of Process Emissions from the U.S. Industrial Sector

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https://pubs.acs.org/doi/abs/10.1021/acs.est.9b07930

Chevron Supported Cost Analysis of Industrial CCS

- **Industrial Processes = 30% (1.95 Billion Mt) of all US GHG emissions**
- **Team including Chevron researcher assessed > 1600 industrial facilities in US.**
- **87.2% of industrial energy comes from grid,** so emissions from this energy were excluded from analysis. Leaving 12.8% of energy related emissions.
- Only 656 facilities potentially viable for CCS/CCUS
- Of which, **less than half were within 200 miles of a feasible injection site.** These sites were heavily concentrated in Louisiana and Texas.
- **Only 123 industrial facilities (~8% of total) had potential to capture CO2 cost effectively, even with EOR and full use of available tax credits.**
- **With the ability to deliver up to 68.5 MtCO2eq/yr, (~3.5% of total industrial sector emissions) IF used for EOR where feasible and supported by the maximum available tax credits.**
- **Use for EOR would effectively eliminate any actual emissions reductions.**

Emission reduction potential by industrial sector

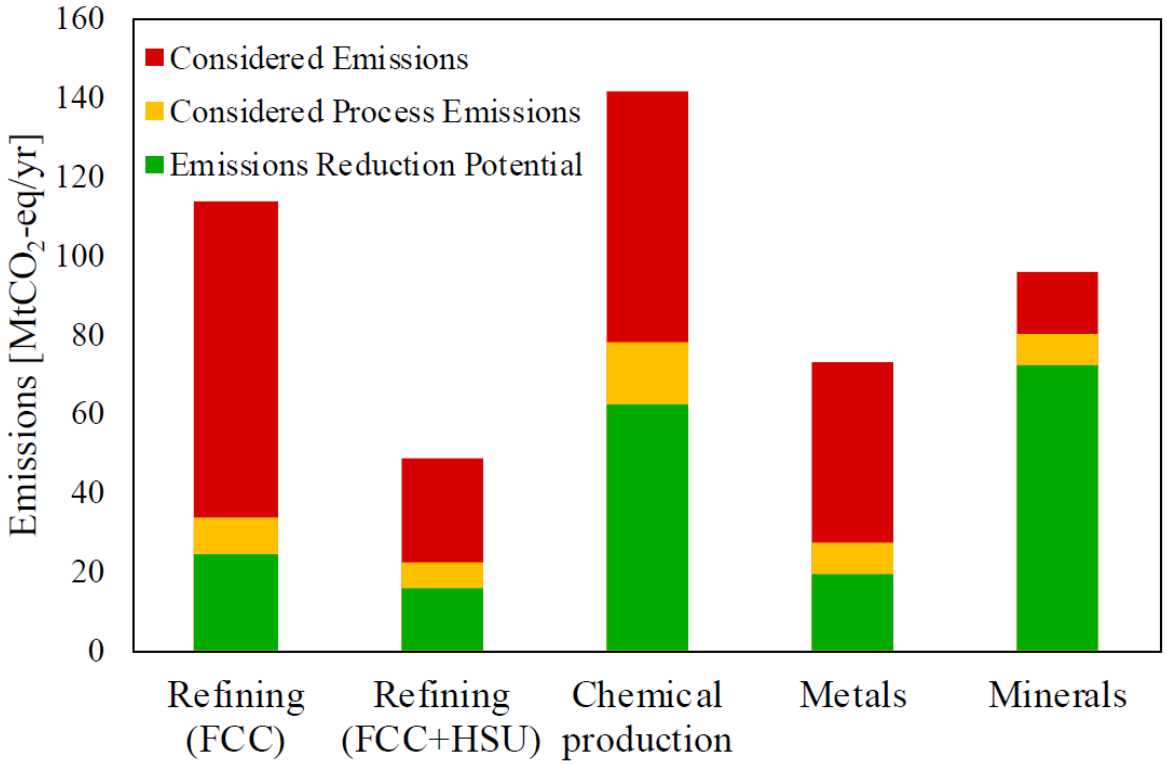
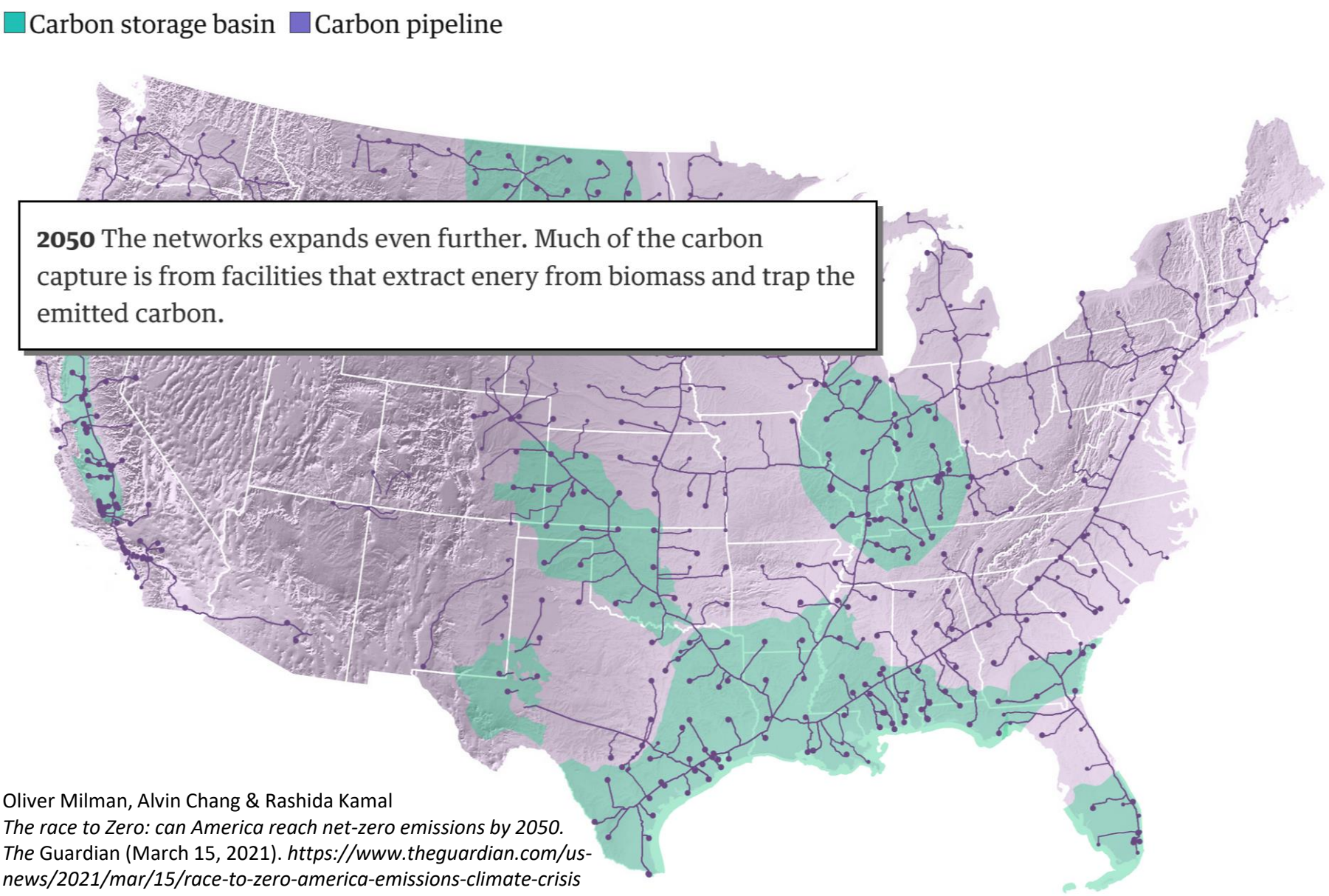


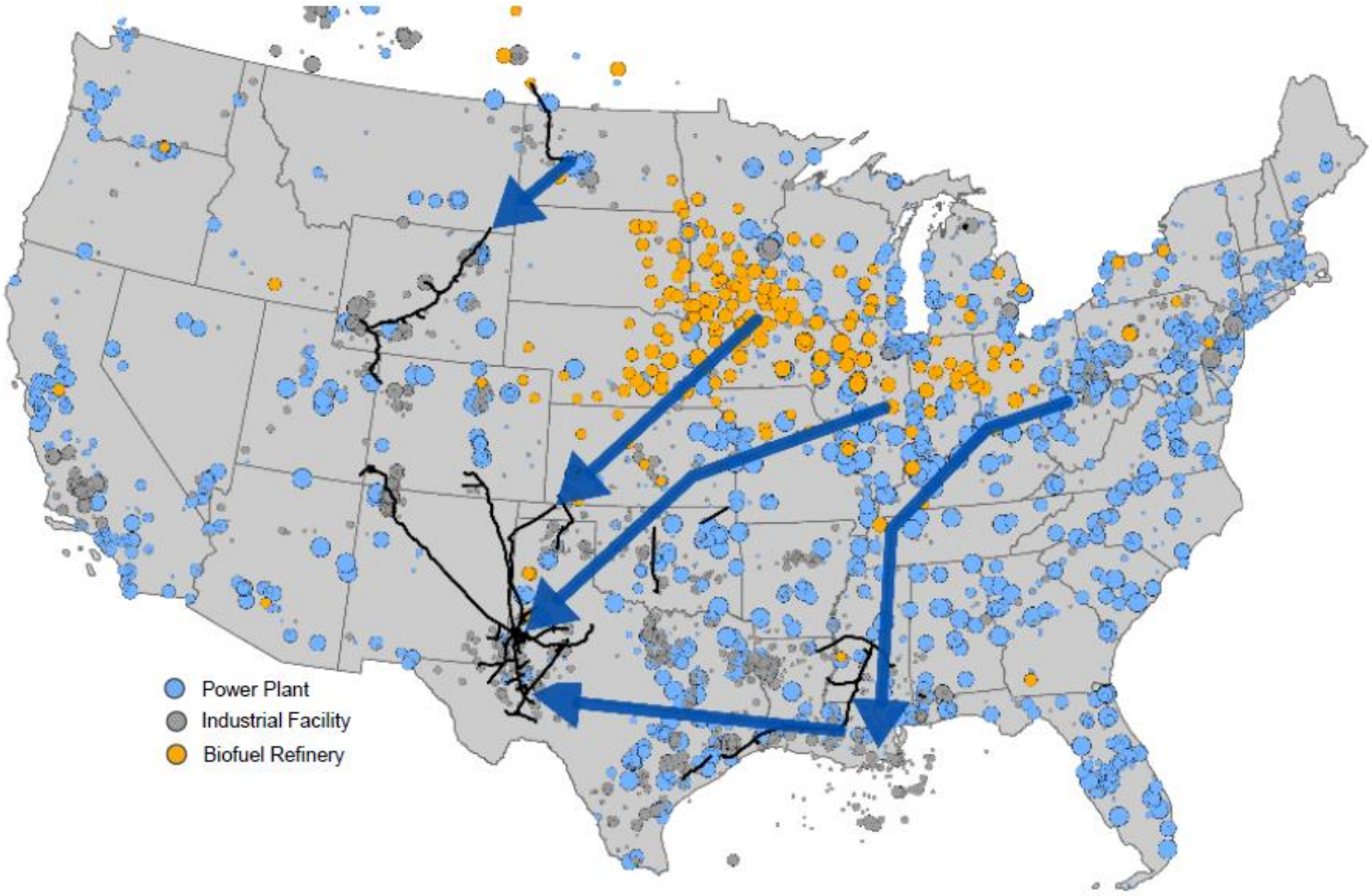
Figure S8. Emission reduction potential by industrial sector relative to the process emissions and the total emissions considered in the present study.

https://pubs.acs.org/doi/abs/10.1021/acs.est.9b07930



Oliver Milman, Alvin Chang & Rashida Kamal
The race to Zero: can America reach net-zero emissions by 2050. *The* Guardian (March 15, 2021). *https://www.theguardian.com/us-news/2021/mar/15/race-to-zero-america-emissions-climate-crisis*

Initial CO_2 Corridor Scoping



Elizabeth Abramson, Regional Carbon Capture and Transport Opportunities for Storage in Louisiana. Presentation to "Developing CCUS Projects in Louisiana and the Gulf Coast" (USDOE/USEA/GCCSI) November 17, 2020.

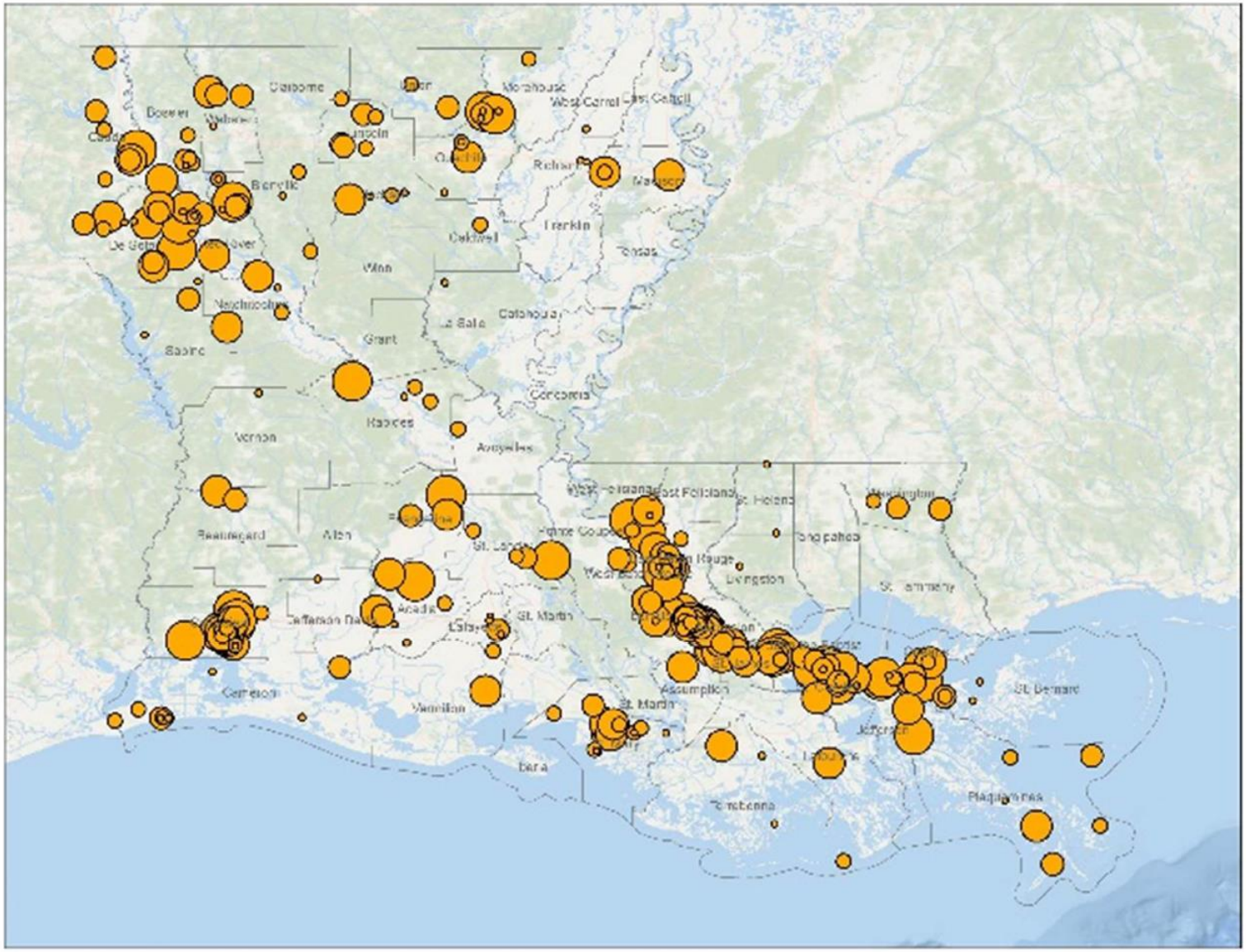


Figure 5. Louisiana industrial carbon source locations
Source: EPA, 2018c, author's construct.

Source: https://www.lsu.edu/ces/publications/2019/doe_carbonsafe_02-18-19.pdf

LOCAL

'Foaming at the mouth': First responders describe scene after pipeline rupture, gas leak

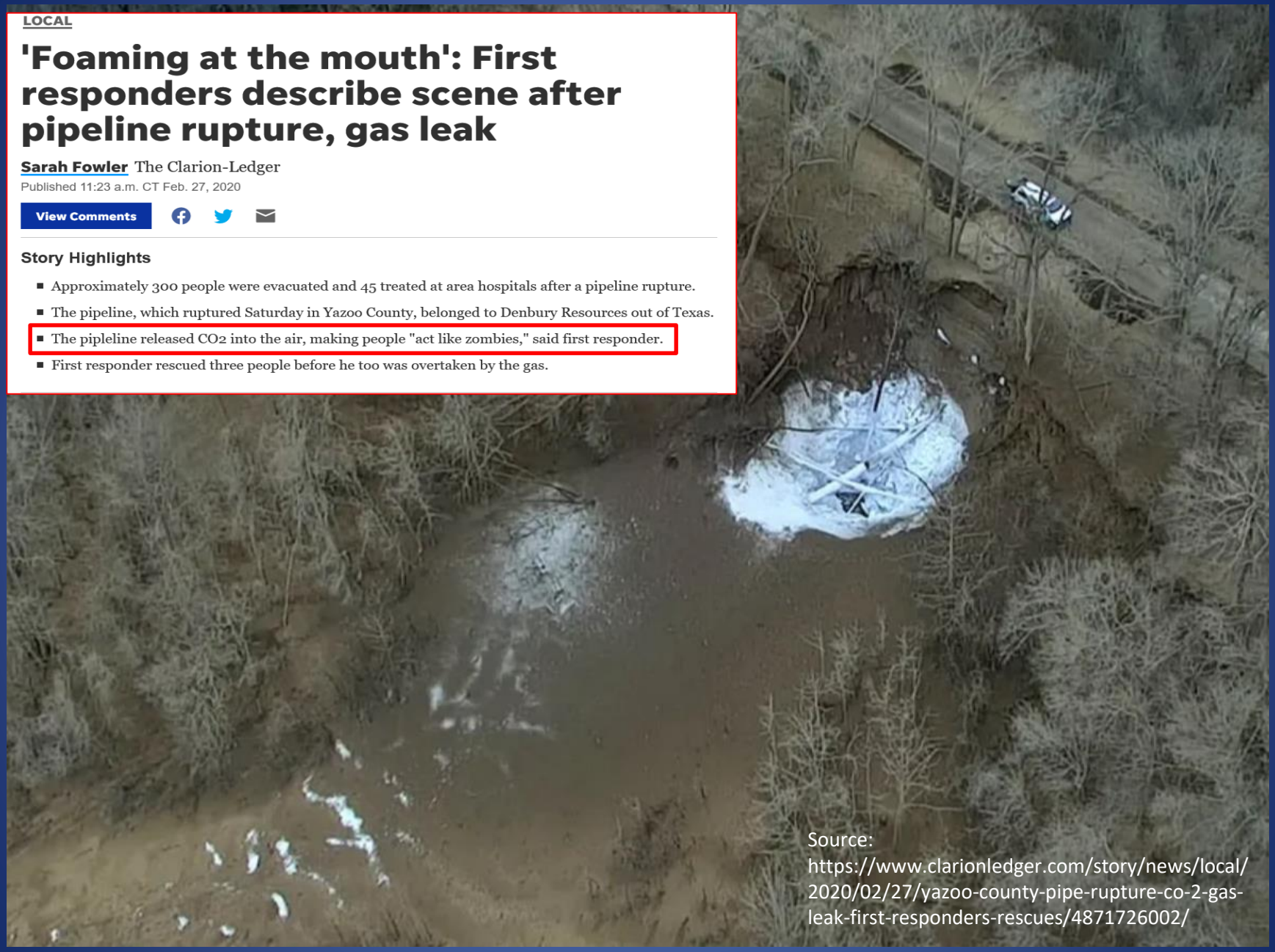
Sarah Fowler The Clarion-Ledger

Published 11:23 a.m. CT Feb. 27, 2020

View Comments

Story Highlights

- Approximately 300 people were evacuated and 45 treated at area hospitals after a pipeline rupture.
- The pipeline, which ruptured Saturday in Yazoo County, belonged to Denbury Resources out of Texas.
- The pipleline released CO_2 into the air, making people "act like zombies," said first responder.
- First responder rescued three people before he too was overtaken by the gas.



Source: https://www.clarionledger.com/story/news/local/2020/02/27/yazoo-county-pipe-rupture-co-2-gas-leak-first-responders-rescues/4871726002/

- https://brandcentral.dnvgl.com/mars/embed?o=4D2E198D781A6E6F&c=10651&a=N

Carbon Dioxide Enhanced Oil Recovery

Untapped Domestic Energy Supply and Long Term Carbon Storage Solution

NATIONAL ENERGY TECHNOLOGY LABORATORY

U.S. DEPARTMENT OF ENERGY

CO2 Injection Options:

EOR—80% of CCS used to produce more oil and gas

Saline Aquifers

If pressure isn't carefully controlled, can produce…

- Earthquakes
- Groundwater contamination from CO_2 or brine
- Fractures/release of CO_2:
- creating both toxic and climate risks

Injecting CO_2 into porous and permeable sedimentary rock will increase the pore fluid pressure above the original reservoir pressure. From a physical point of view, many of the impediments to industrial-scale CCS arise from this overpressure because it is a key driver for geomechanical and hydrologic hazards: induced seismicity; fault reactivation; caprock fracture; leakage through wells, faults, or fractures; and CO_2 and displaced brine migration to shallow aquifers

Produced Water (Brines)

Environmentalists question use of radioactive brine waste to treat roads

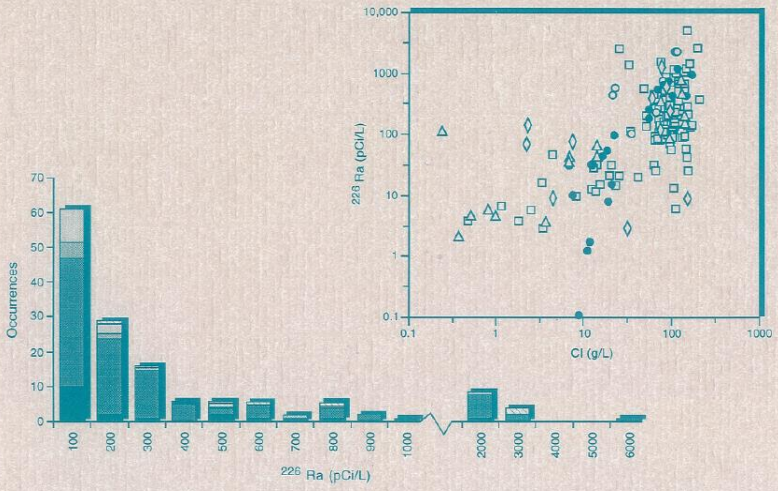
▲ HIDE CAPTION

Environmentalists are concerned that processed brine waste from oil and natural gas drilling could raise levels of radium — a radioactive metallic element found in the brine — in soil and groundwater. [File photo]

Geological Circular 95-3

Naturally Occurring Radioactive Materials (NORM) in Produced Water and Scale from Texas Oil, Gas, and Geothermal Wells: Geographic, Geologic, and Geochemical Controls

R. Stephen Fisher



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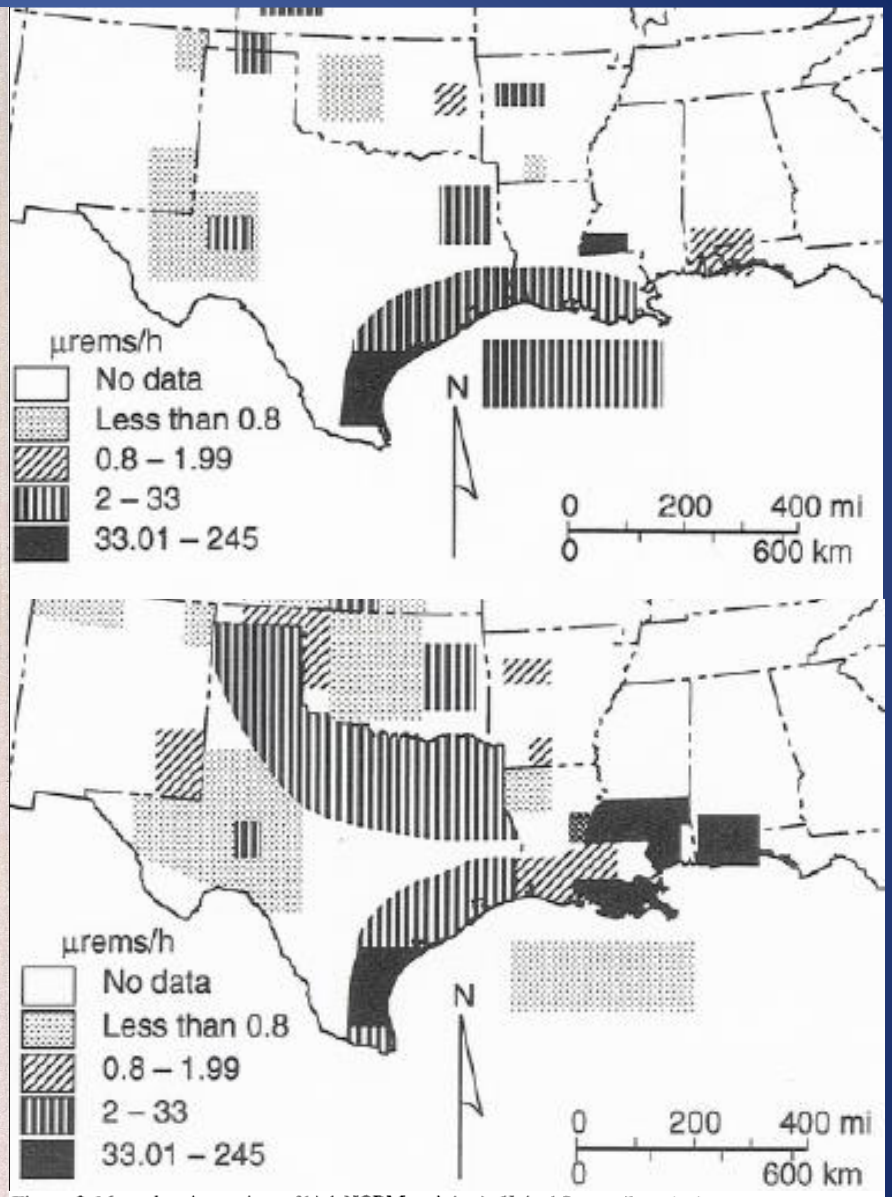
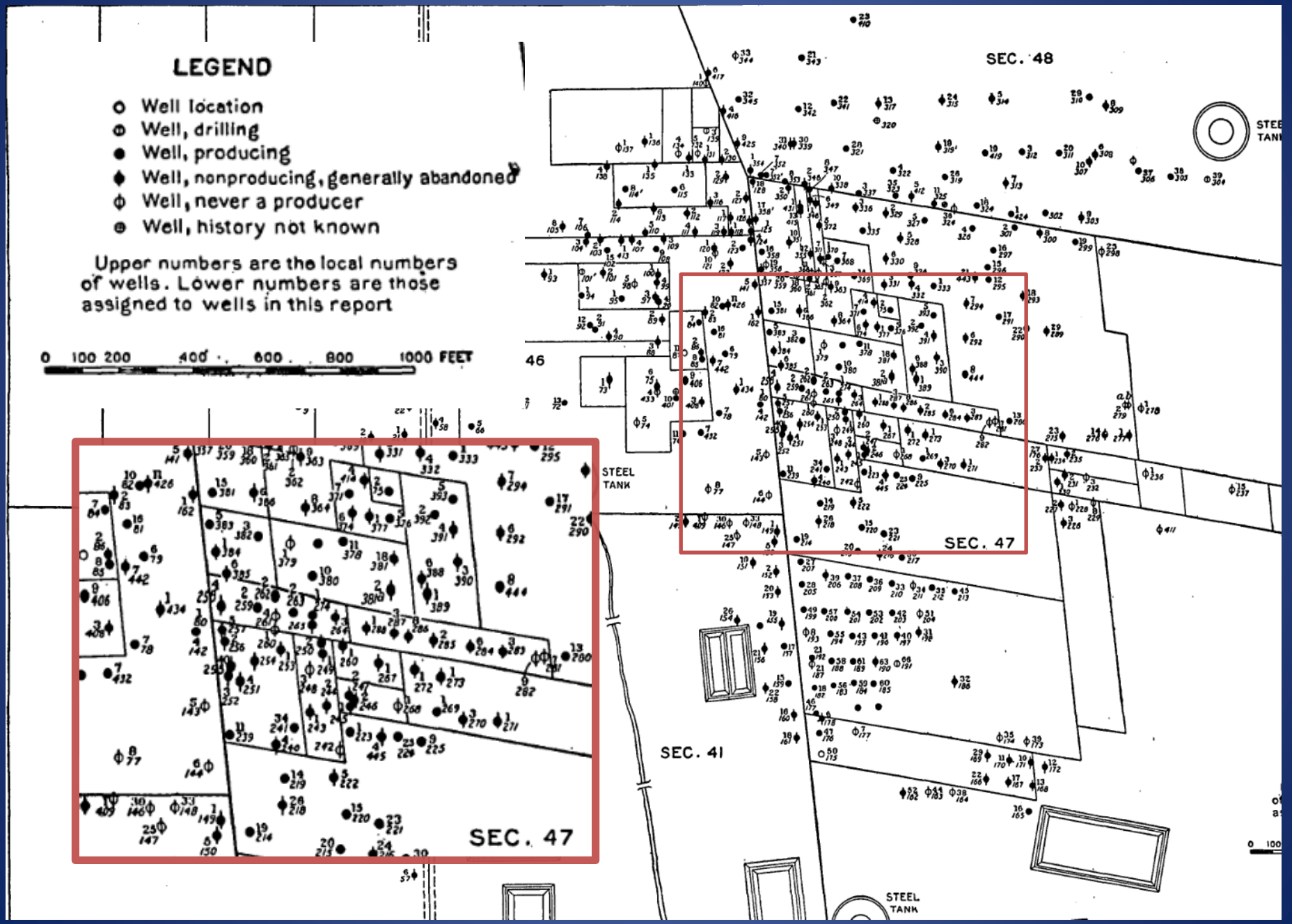


Figure 2. Maps showing regions of high NORM activity in United States oil-producing facilities (a) and gas-processing facilities (b). Values are aggregated median difference over background (Otto, 1989).


LEGEND
Well location
Well, drilling
Well, producing
Well, nonproducing, generally abandoned
Well, never a producer
Well, history not known
Upper numbers are the local numbers of wells. Lower numbers are those assigned to wells in this report
0 100 200 400 600 800 1000 FEET
SEC. 48
SEC. 47
SEC. 41
STEEL TANK
STEEL TANK
46

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